

THE CLAIMS

1. In a digitized tomosynthesis method for obtaining 3D volumetric imaging of an object in which a ray of energy from a source travels through the object to impinge on an energy sensor having a determined pixel size defining an image plane and in which the object is rotated about an axis that intersects the energy sensor whereby an image is acquired by the energy sensor at successive rotational positions of the object, the improvement according to which the coordinate of the source position with respect to the ray of energy is determined, comprising the steps of:

placing a first registration marker that is substantially opaque to the energy on a first location proximate the energy sensor and along the object's axis of rotation;

obtaining a first shadow image corresponding to the first registration marker by exposing the first registration marker to energy from the energy source;

placing a second registration marker that is substantially opaque to the energy on a calibration post disposing the second registration marker at location distal from the energy sensor spaced at a predetermined distance from said first location along the object's axis of rotation;

obtaining a second shadow image of the calibration post corresponding to the second registration marker by exposing the second registration marker to energy from the energy source;

determining the distance from the source to the energy sensor at the intersection of the axis with the energy sensor;

determining the height of the second marker;

determine the central coordinates of the first and second marker shadows;

computing the azimuth;

computing the elevation angle; and

using the elevation angle and azimuth to compute the coordinate of source position with respect to the sensor.

2. The method of claim 1 in which the azimuth is computed from the triangle formed by the marker centers and image axes.

3. The method of claim 1 in which the elevation angle is computed by:
computing an angle A as the arc tangent of (the height of the calibration

post divided by the length of the shadow of the calibration post);

computing an angle B as the arc sine of (the sine of angle A times the shadow of the calibration post divided by the source distance);

computing an angle C as $180^\circ - A - B$;

computing a distance c as the square root of H_p^2 plus $L_s^2 - 2.0 \times H_p \times L_s \times \cosine(C)$, where H_p is the height of the calibration post and L_s is the length of the shadow of the calibration post;

computing the height y of the source above the image plane as $c \times \sin(A)$; and

computing the elevation angle as arc sine of (y divided by the source distance).

4. The method of claim 1 in which the energy is in the form of electromagnetic radiation.

5. The method of claim 3 in which the electromagnetic radiation is x-ray radiation.

6. The method of claim 1 in which the energy sensor is an image plate.

7. The method of claim 1 in which the optical axis of the source is perpendicular to the image plane.

8. The method of claim 1 wherein the first registration marker and the second registration marker are the same marker.

9. The method of claim 1 wherein the calibration post is substantially transparent to said ray of energy.

10. In a digitized tomosynthesis method for obtaining 3D volumetric imaging of an object in which x-ray radiation from a source travels through the object to impinge on an image plate having a determined pixel size defining an image plane and in which the object is rotated about an axis that intersects the image plate whereby an image is acquired by the image plate at successive rotational positions of the object, the improvement according to which the coordinate of the source position with respect to

the image plate is determined, comprising the steps of:

- placing a first registration marker that is substantially opaque to the x-ray radiation on a first location proximate the image plate and along the object's axis of rotation;

- obtaining a first shadow image corresponding to the first registration marker by exposing the first registration marker to the x-ray radiation;

- placing a second registration marker that is substantially opaque to the x-ray radiation on a calibration post that is substantially transparent to said x-ray radiation, to dispose the second registration marker at location distal from the image plate at a predetermined distance from said first location along the object's axis of rotation;

- obtaining a second shadow image of the calibration post corresponding to the second registration marker by exposing the second registration marker to the x-ray radiation;

- determining the distance from the source to the image plate at the intersection of the axis with the x-ray radiation;

- determining the height of the second marker;

- determine the central coordinates of the first and second marker shadows;

- computing the azimuth from the triangle formed by the marker centers and image axes;

- computing the elevation angle by computing an angle A as the arc tangent of (the height of the calibration post divided by the length of the shadow of the calibration post), computing an angle B as the arc sine of (the sine of angle A times the shadow of the calibration post divided by the source distance), computing an angle C as $180^\circ - A - B$, computing a distance c as the square root of $H_p^2 + L_s^2 - 2.0 \times H_p \times L_s \times \cosine(C)$, where H_p is the height of the calibration post and L_s is the length of the shadow of the calibration post, computing the height y of the source above the image plane as $c \times \sin(A)$, and computing the elevation angle as arc sine of (y divided by the source distance);

- using the elevation angle and azimuth to compute the coordinate of source position with respect to the image plate.